

Data Evaluation Report on the Toxicity of Neudorff's Insecticidal Soap Concentrate (AI: potassium salts of fatty acids) to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number {.....}

EPA MRID Number 48402301

Data Requirement: PMRA Data Code: 9.8.4 (TGAI) or 9.8.6 (EP)
EPA DP Barcode: 388702
OECD Data Point: IIA 8.12 (TGAI) and IIIA 10.8.1.1 (EP)
EPA Guideline: 850.4100 Tier II

Purity: 46.8%

Test material: Neudorff's Insecticidal Soap Concentrate (AI: potassium salts of fatty acids)

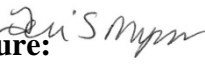
Common name

Chemical name: IUPAC
CAS name
CAS No.
Synonyms:


Primary Reviewer: Joan Gaidos
Senior Scientist, Cambridge Environmental, Inc.

Signature: 
Date: 12/14/11

Secondary Reviewer: Teri S. Myers
Senior Scientist, Cambridge Environmental Inc.

Signature: 
Date: 12/19/11

Primary Reviewer: Stephen Carey, Biologist
EPA/OCSP/OPP/EFED/ERB6

Signature: 
Date: 5/17/12

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CITATION: Martin, J.A. 2011. Neudorff's Insecticidal Soap Concentrate – Seedling Emergence Test Following U.S. EPA OPPTS Draft Guideline 850.4225. Unpublished study performed by Smithers Viscient, Wareham, Massachusetts. Study no. 13989.6110. Study sponsored by W. Neudorff GmbH KG, Great Falls, Virginia. Study completed February 18, 2011.

DISCLAIMER: This document provides guidance for EPA and PMRA reviewers on how to complete a data evaluation record after reviewing a scientific study concerning the acute toxicity of a pesticide to terrestrial vascular plants. It is not intended to prescribe conditions to any external party for conducting this study nor to establish absolute criteria regarding the assessment of whether the study is scientifically sound and whether the study satisfies any applicable data requirements. Reviewers are expected to review and to determine for each study, on a case-by-case basis, whether it is scientifically sound and provides sufficient information to satisfy applicable data requirements. Studies that fail to meet any of the conditions may be accepted, if appropriate; similarly, studies that meet all of the conditions may be rejected, if appropriate. In sum, the reviewer is to take into account the totality of factors related to the test methodology and results in determining the acceptability of the study.

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PMRA Submission Number {.....}

EPA MRID Number 48402301

EXECUTIVE SUMMARY:

The effect of **Neudorff's Insecticidal Soap Concentrate (AI: potassium salts of fatty acids)** on the seedling emergence of monocot (corn, *Zea mays*; oats, *Avena sativa*; onion, *Allium cepa*; and ryegrass, *Lolium perenne*) and dicot (common bean, *Phaseolus vulgaris*; cucumber, *Cucumis sativa*; oilseed rape, *Brassica napus*; radish, *Raphanus sativus*; soybean, *Glycine max*; and Tomato, *Lycopersicon esculentum*) crops was studied at nominal concentrations of 0 (negative control), 4.07, 8.14, 16.27, 32.54, and 65.08 lbs a.i./A; equivalent to measured concentrations of 0, 4.49, 8.10, 16.83, 34.91 and 68.57 lb a.i./A (cucumber, oat, oilseed rape, onion, ryegrass) and radish and 0, 4.43, 8.73, 16.83, 34.29 and 68.57 lbs a.i./A (common bean, corn, soybean and tomato).

The growth medium used in the seedling emergence test was a soil from Rochester, Massachusetts (sandy loam, pH 6.0, organic matter 2.2%). On day 14 the surviving plants per pot were recorded.

There was no significant effect on dry weight in any species. Height was significantly affected in cucumber and tomato with maximum inhibitions of 24% and 22%, respectively. Emergence and survival were affected in cucumber and soybean with maximum inhibitions of 50% and 43%, respectively.

None of the monocot species were affected; the NOAEC and EC₂₅ values were 68.57 and >68.57 lb a.i./A, respectively.

The most sensitive dicot species was cucumber, based on emergence and survival, with NOAEC, EC₀₅ and EC₂₅ values of 68.57, 1.65 and 23.8 lbs a.i./A, respectively; the 95% confidence interval associated with the EC₂₅ estimate was not calculable, so this estimate may not be reliable. Cucumber emergence and survival were inhibited 4-50%, compared to the negative control, across all test concentrations and there was no evidence of a pattern or step-wise inhibition.

Morphological abnormalities (e.g. chlorosis of leaves) were determined based on a range from 0 to 100, where 0 indicates no injury or abnormality and 100 indicates complete effect (dead plant; not further described). The mean abnormality rating in the control was 4. Bean and cucumber exhibited effects up to 18; no other species were affected.

This toxicity study is scientifically sound and satisfies the guideline requirement for a terrestrial plant seedling emergence study. The study is classified as ACCEPTABLE.

Maximum Labeled Rate: Not reported

Results Synopsis

Data Evaluation Report on the Toxicity of Neudorff's Insecticidal Soap Concentrate (AI: potassium salts of fatty acids) to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number {.....}

EPA MRID Number 48402301

Monocot

EC₅₀/IC₅₀: >68.57 lbs a.i./A 95% C.I.: N/A

EC₂₅/IC₂₅: >68.57 lbs a.i./A 95% C.I.: N/A

EC₀₅/IC₀₅: >68.57 lbs a.i./A 95% C.I.: N/A

NOAEC: 68.57 lbs a.i./A

Slope: N/A

Std err: N/A

Most sensitive monocot: None

Most sensitive parameter: N/A

Dicot

EC₅₀/IC₅₀: >68.57 lbs a.i./A 95% C.I.: N/A

EC₂₅/IC₂₅: 23.8 lbs a.i./A* 95% C.I.: Not calculable

EC₀₅/IC₀₅: 1.65 lbs a.i./A* 95% C.I.: Not calculable

NOAEC: 68.57 lbs a.i./A

Slope: 6.87

Std err: 0.95- 49.81

Most sensitive dicot: Cucumber

Most sensitive parameter: Emergence and Survival

* Toxicity value should be interpreted with great caution as the 95% confidence intervals appear unreliable.

Table 1 (Tier II studies). Summary of most sensitive parameters by species (lbs a.i./A); survival = # survived/# planted.

Species	Endpoint	NOEC	EC ₀₅	EC ₂₅	EC ₅₀
Corn	None	68.57	>68.57	>68.57	>68.57
Onion	None	68.57	0.00044	>68.57	>68.57
Ryegrass	None	68.57	53.18	>68.57	>68.57
Oat	None	68.57	>68.57	>68.57	>68.57
Bean	None	68.57	>68.57	>68.57	>68.57
Cucumber	Emergence and Survival	16.83	1.65*	23.8*	>68.57
Oilseed Rape	None	68.57	>68.57	>68.57	>68.57
Radish	None	68.57	>68.57	>68.57	>68.57
Soybean	Emergence and Survival	68.57	4.07	43.79	>68.57
Tomato	None	<4.46	21 x 10 ⁻⁷ *	>68.57	>68.57

* Toxicity value should be interpreted with great caution as it is either not bracketed by the test concentrations and/or the 95% confidence intervals appear unreliable.

Data Evaluation Report on the Toxicity of Neudorff's Insecticidal Soap Concentrate (AI: potassium salts of fatty acids) to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number {.....}

EPA MRID Number 48402301

I. MATERIALS AND METHODS

GUIDELINE FOLLOWED: The methods used in conducting this study were based on procedures specified in the U.S. EPA Series 850 – Ecological Effects Test Guidelines OPPTS Number 850.4225.

COMPLIANCE: Signed and dated GLP, Quality Assurance and No Data Confidentiality statements were provided. This study was conducted in compliance with FIFRA Good Laboratory Practice Standards as published by the U.S. EPA, 40 CFR Part 160 (1989), with the following exception: routine soil and water analyses were conducted at GeoLabs, Braintree, Massachusetts using standard EPA procedures.

A. MATERIALS:

1. Test Material **Neudorff's Insecticidal Soap Concentrate (AI: potassium salts of fatty acids)**

Description: Not reported
Lot No./Batch No. : PG 5-192-1 (batch no.)
Purity: 46.8% potassium salts of fatty acids

Stability of compound under test conditions: Analytical verification was performed by analyzing stock solutions with recoveries of 100-110%. Recoveries of nominal fortified control samples were 79.5-104%.

Storage conditions of test chemicals: The test material was stored at room temperature in the dark in a ventilated cabinet.

Data Evaluation Report on the Toxicity of Neudorff's Insecticidal Soap Concentrate (AI: potassium salts of fatty acids) to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number {.....}

EPA MRID Number 48402301

Table 2. Physical/chemical properties of Neudorff's Insecticidal Soap Concentrate (AI: potassium salts of fatty acids).		
Parameter	Values	Comments
Water solubility at 20°C	Not reported	
Vapor pressure	Not reported	
UV absorption	Not reported	
pKa	Not reported	
Kow	Not reported	

2. Test organism:

Monocotyledonous species: Corn (*Zea mays*; Truckers Favorite Field Corn), Oats (*Avena sativa*, Jerry), Onion (*Allium cepa*, Granex Yellow Hybrid), and Ryegrass (*Lolium perenne*, LINN).

Dicotyledonous species: Common bean (*Phaseolus vulgaris*, Festina), Cucumber (*Cucumis sativa*, Sweet Marketmore), Oilseed rape (*Brassica napus*, Wichita), Radish (*Raphanus sativus*, Cherriette Hybrid), Soybean (*Glycine max*, Edible Early Hakucho), and Tomato (*Lycopersicon esculentum*, Celebrity Hybrid).

Seed source: Common bean, onion, radish, soybean and tomato were supplied by Park Seed Company, Greenwood, South Carolina; corn supplied by Carolina Biological Supply Company, Burlington, North Carolina; cucumber and oat supplied by Seeds of Change, Santa Fe, New Mexico; oilseed rape supplied by Johnston Grain Company, Enid, Oklahoma; and perennial ryegrass supplied by Granite Seed, Lehi, Utah.

Prior seed treatment/sterilization: Seeds were not treated with fungicides, insecticides, or repellents prior to test initiation.

Historical % germination of seed: Corn, 90%; oats, 91%; onion, NA; ryegrass, 95%; common bean, NA; cucumber, NA; oilseed rape, 90%; radish, NA; soybean, 98%, and tomato, NA.

(NA=Not Applicable, as reported by the study author)

Seed storage, if any: All seeds refrigerated in the dark until test initiation.

B. STUDY DESIGN:

1. Experimental Conditions

a. Limit test: N/A- Conducted as a Tier II test.

Data Evaluation Report on the Toxicity of Neudorff's Insecticidal Soap Concentrate (AI: potassium salts of fatty acids) to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number {.....}

EPA MRID Number 48402301

b. Range-finding study: No range-finding studies were reported.

c. Definitive Study: The in-life portion of the test with cucumber, oat oilseed rape, onion, perennial ryegrass and radish was conducted from November 16 to December 10, 2010. Bean, corn, tomato and soybean were tested from December 16, 2010 to January 3, 2011.

Table 3: Experimental Parameters - Seedling Emergence.		
Parameters	Seedling Emergence	
	Details	Remarks
		<i>Criteria</i>
Duration of the test	14 days	<i>Recommended test duration is 14-21 days.</i> <i>OECD recommends that the test be terminated no sooner than 14 days after 50 percent of the control seedlings have emerged</i>
Number of seeds/plants/species/replicate	10 seeds per replicate	<i>Ten seeds per replicate should be used.</i> <i>OECD recommends a minimum of five seeds planted in each replicate within 24 hours of incorporation of the test substance. All seeds of each species for each test should be of the same size class. The seed should not be imbibed.</i>
<u>Number of replicates</u> Control: Adjuvant control: Treated:	<u>Oat, onion and ryegrass</u> 4 N/A 4 <u>Radish and tomato</u> 6 N/A 6 <u>Bean, corn, cucumber, oilseed rape and soybean</u> 10 N/A 10	<i>Four replicates per dose should be used.</i> <i>OECD recommends a minimum of four replicates per treatment</i>

Data Evaluation Report on the Toxicity of Neudorff's Insecticidal Soap Concentrate (AI: potassium salts of fatty acids) to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number {.....}

EPA MRID Number 48402301

Table 3: Experimental Parameters - Seedling Emergence.		
Parameters	Seedling Emergence	
	Details	Remarks
		<i>Criteria</i>
<u>Test concentrations</u> Nominal: Measured:	0 (negative control), 4.07, 8.14, 16.27, 32.54, and 65.08 lbs a.i./A; <u>Cucumber, oat, oilseed rape, onion, ryegrass and radish</u> 0, 4.49, 8.10, 16.83, 34.91 and 68.57 lb a.i./A <u>Common bean, corn, soybean and tomato</u> 0, 4.43, 8.73, 16.83, 34.29 and 68.57 lbs a.i./A	<i>Five test concentrations should be used with a dose range of 2X or 3X progression</i> <i>OECD recommends three concentrations, preferably with application rates equivalent to 0.0 (control), 1.0, 10.0 and 100 mg substance per kg of oven-dried soil.</i>
<u>Method and interval of analytical verification</u> LOQ: LOD:	Calibration standards, and matrix fortification samples were analyzed using HPLC with UV detection (205 nm) 31.0 mg a.i./L Set at the lowest analytical standard analyzed	
Adjuvant (type, percentage, if used)	N/A	
<u>Test container (pot)</u> Size/Volume Material: (glass/polystyrene)	14 cm top diameter, 11.5 cm bottom diameter; 12 cm depth Polypropylene	Interior base of the pots was fitted with a 20 cm diameter filter paper. <i>Non-porous containers should be used.</i> <i>OECD recommends that non-porous plastic or glazed pot be used.</i>
Growth facility	Greenhouse	
Method/depth of	Seeds were planted at a	

Data Evaluation Report on the Toxicity of Neudorff's Insecticidal Soap Concentrate (AI: potassium salts of fatty acids) to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number {.....}

EPA MRID Number 48402301

Table 3: Experimental Parameters - Seedling Emergence.		
Parameters	Seedling Emergence	
	Details	Remarks
		<i>Criteria</i>
seeding	depth of <i>ca.</i> 1 to 2 cm in a circular pattern around the inside perimeter of the pot.	
<u>Test material application</u> Application time including the plant growth stage Number of application Application interval Method of application	Test material was applied on the soil surface after the seeds were planted. 1 N/A; single application Applied using an overhead sprayer (Spray Systems Company) equipped with an atomizing spray nozzle. Distance above the soil surface was not reported.	
<u>Details of soil used</u> Geographic location Depth of soil collection Soil texture % sand % silt % clay pH: % organic carbon CEC Moisture at 1/3 atm (%)	Rochester, Massachusetts N/A Sandy loam 89 8 3 Not reported 1.3% Not reported Not reported	Organic matter: 2.2% <hr/> <i>Soil mixes containing sandy loam, loam, or clay loam soil with no greater than 2% organic matter are preferable. Glass beads, rock wool, and 100% acid washed sand are not preferred.</i> <i>OECD prefers the soil to be sieved (0.5 cm) to remove coarse fragments. Carbon content should not exceed 1.5% (3% organic matter). Fine particles (under 20um) makeup should be between 10 and 20%. The recommended pH is between 5.0 and 7.5.</i>

Data Evaluation Report on the Toxicity of Neudorff's Insecticidal Soap Concentrate (AI: potassium salts of fatty acids) to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number {.....}

EPA MRID Number 48402301

Table 3: Experimental Parameters - Seedling Emergence.		
Parameters	Seedling Emergence	
	Details	Remarks
		<i>Criteria</i>
Details of nutrient medium, if used	Each pot received <i>ca.</i> 100 mL of 400 mg/L Peters 20-20-20 fertilizer solution.	
<u>Watering regime and schedules</u> Water source/type: Volume applied: Interval of application: Method of application:	Deionized water with nutrient medium twice weekly. All other using well water. <i>Ca.</i> 100 mL/pot Not reported. The plants were bottom-watered using subirrigation trays.	 <i>EPA prefers that bottom watering be utilized for seedling emergence studies so that the chemical is not leached out of the soil during the test.</i>
Any pest control method/fertilization, if used	None reported	
<u>Test conditions</u> Temperature: Photoperiod: Light intensity and quality: Relative humidity:	17-29°C 16L:8D Artificial lighting used to supplement natural sunlight. 6700-28000 lux 19-102%	 <i>EPA prefers that the cold vs warm loving plants be tested in two separate groups to optimize plant growth.</i> <i>OECD prefers that the temperature, humidity and light conditions be suitable for maintaining normal growth of each species for the test period.</i>

Data Evaluation Report on the Toxicity of Neudorff's Insecticidal Soap Concentrate (AI: potassium salts of fatty acids) to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number {.....}

EPA MRID Number 48402301

Table 3: Experimental Parameters - Seedling Emergence.		
Parameters	Seedling Emergence	
	Details	Remarks
		<i>Criteria</i>
Reference chemical (if used) Name: Concentrations:	N/A	
Other parameters, if any	None	

2. Observations:

Table 4: Observation Parameters - Seedling Emergence.		
Parameters	Seedling Emergence	
	Details	Remarks
Parameters measured (e.g., number of germinated seeds, emerged seedlings, plant height, dry weight or other endpoints)	<ul style="list-style-type: none"> - Emergence - Survival - Phytotoxicity - Dry weight - Height 	
Measurement technique for each parameter	Emergence, survival, and phytotoxicity were determined visually. Height was measured (details not reported) and shoots dried ($70 \pm 5^{\circ}\text{C}$) for three days to determine dry weight.	
Observation intervals	Emergence was measured weekly. Survival,	

Data Evaluation Report on the Toxicity of Neudorff's Insecticidal Soap Concentrate (AI: potassium salts of fatty acids) to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number {.....}

EPA MRID Number 48402301

	phytotoxicity, height, and dry weight were determined at study termination.	
Other observations, if any	None	
Were raw data included?	Yes	
Phytotoxicity rating system, if used	0- No injury or abnormality; 100- Complete effect (dead plant)	

II. RESULTS and DISCUSSION:

A. INHIBITORY EFFECTS:

1. Seedling Emergence:

All inhibitions reported below are based on comparison to the negative control.

Seedling emergence ranged from 77 to 100% in the negative control. There was promotion of emergence for oilseed rape of -4 to -12% at all treatment levels above 4.43 lb a.i./A, and oat experienced no inhibition in emergence. Inhibitions in emergence ranged from 0 to 16% for bean, tomato, onion, ryegrass and radish. Corn and soybean had an inhibition of 23% and 43%, respectively. Cucumber had inhibitions of 50% and 32% at the highest treatment levels.

Survival ranged from 82 to 100% in the negative control. The study authors considered survival as the number survived of the number planted. Wheat experienced no inhibitions in survival. Soybean, carrot, radish, ryegrass, and corn had inhibitions in survival ranging from 8 to 21%. Onion and flax had inhibitions of 52 and 56%, respectively. Tomato and lettuce were the most affected, with inhibitions of 86 and 90%, respectively.

The study authors analyzed dry weight per replicate data. Bean, corn, soybean, tomato, oat, ryegrass and radish generally experienced promotion of growth. Oilseed rape had a 13% inhibition and onion at 21 and 31% inhibitions.

Bean, corn, soybean, oat, oilseed rape, and ryegrass generally experienced promotion in height. Inhibitions in height ranged from 1 to 24% in cucumber, onion, and radish. Tomato experience inhibitions of 11% to 22% at all treatment levels.

Data Evaluation Report on the Toxicity of Neudorff's Insecticidal Soap Concentrate (AI: potassium salts of fatty acids) to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number {.....}

EPA MRID Number 48402301

Based on the study authors' results, there was no effect on monocots; NOAEC and EC₂₅ values of 65.08 and >65.08 lbs a.i./A. The most sensitive dicot species was bean, based on emergence, with NOAEC and EC₂₅ values of 65.08 and 9.4 lbs a.i./A, respectively.

Morphological abnormalities (e.g. chlorosis of leaves) were determined based on a range from 0 to 100, where 0 indicates no injury or abnormality and 100 indicates complete effect (dead plant; not further described). The mean abnormality rating in the control was 4. Bean and cucumber exhibited effects up to 18; no other species were affected.

B. REPORTED STATISTICS:

Emergence, survival, dry weight per replicate, and height data were analyzed. After checking for normality using Chi-squared or Shapiro-Wilks' Tests and for homogeneity of variance using Bartlett's Test, the LOAEC and NOAEC values were determined using Dunnett's test or Bonferroni's test. If the data did not pass the test homogeneity or normality, the Kruskal-Wallis test was used. All statistical determinations were made with 95% certainty. Estimates of the EC_x values and their confidence limits were determined using the non-linear regression analysis of Bruce and Versteeg when reductions in endpoints among one or more treatment groups were 25% or more relative to the control means. These analyses were conducted using the CETIS – Comprehensive Environmental Toxicity Information System (Ives, 2009), version 1.8. Nominal concentrations were used for all analyses.

Data Evaluation Report on the Toxicity of Neudorff's Insecticidal Soap Concentrate (AI: potassium salts of fatty acids) to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number {.....}

EPA MRID Number 48402301

Table 5: Reported effect of Neudorff's Insecticidal Soap Concentrate (AI: potassium salts of fatty acids) on Seedling Emergence

Species	Results summary for biomass (lbs a.i./A)								
	Weight (g)	NOAEC	EC ₀₅	95% CI	EC ₂₅	95% CI	EC ₅₀	95% CI	LOAEC
Corn	0.1624-0.1887	65.08	>65.08	N/A	>65.08	N/A	>65.08	N/A	>65.08
Onion	0.0029-0.0042	65.08	0.75	0.27-52	>65.08	N/A	>65.08	N/A	>65.08
Ryegrass	0.0056-0.0064	65.08	>65.08	N/A	>65.08	N/A	>65.08	N/A	>65.08
Oat	0.0533-0.0594	65.08	>65.08	N/A	>65.08	N/A	>65.08	N/A	>65.08
Bean	0.1633-0.2607	65.08	>65.08	N/A	>65.08	N/A	>65.08	N/A	>65.08
Cucumber	0.0547-0.0921	65.08	0.26	N/A	>65.08	N/A	>65.08	N/A	>65.08 ¹
Oilseed rape	0.0519-0.0647	65.08	>65.08	N/A	>65.08	N/A	>65.08	N/A	>65.08
Radish	0.0713-0.0972	65.08	12	3.0-ND	>65.08	N/A	>65.08	N/A	>65.08
Soybean	0.2125-0.3038	65.08	>65.08	N/A	>65.08	N/A	>65.08	N/A	>65.08
Tomato	0.0063-0.0086	65.08	>65.08	N/A	>65.08	N/A	>65.08	N/A	>65.08

¹ Although treatment group means were reduced by 38% relative to the control at 32.54 lb a.i./A treatment level, the reduction was not dose-responsive and the EC₂₅ value was interpreted by the study authors as not being biologically-meaningful.

N/A - Since less than the defined percent inhibition was observed, the EC₀₅, EC₂₅ and EC₅₀ values were empirically estimated, therefore, 95% confidence limits could not be determined.

Table 5a: Reported effect of Neudorff's Insecticidal Soap Concentrate (AI: potassium salts of fatty acids) on Seedling Emergence.

Species	Results summary for height (lbs a.i./A)								
	Height(cm)	NOEC	EC ₀₅	95% CI	EC ₂₅	95% CI	EC ₅₀	95% CI	LOEC
Corn	28.7-31.8	65.08	>65.08	N/A	>65.08	N/A	>65.08	N/A	>65.08
Onion	7.4-8.5	65.08	2.2	N/A	>65.08	N/A	>65.08	N/A	>65.08
Ryegrass	11.4-13.2	65.08	>65.08	N/A	>65.08	N/A	>65.08	N/A	>65.08
Oat	24.4-26.9	65.08	>65.08	N/A	>65.08	N/A	>65.08	N/A	>65.08
Bean	5.0-7.0	65.08	>65.08	N/A	>65.08	N/A	>65.08	N/A	>65.08
Cucumber	2.8-3.6	65.08	5.7	ND-29	>65.08	N/A	>65.08	N/A	>65.08 ¹
Oilseed rape	3.9-4.5	65.08	>65.08	N/A	>65.08	N/A	>65.08	N/A	>65.08
Radish	1.9-2.2	65.08	15	3.0-ND	>65.08	N/A	>65.08	N/A	>65.08

Data Evaluation Report on the Toxicity of Neudorff's Insecticidal Soap Concentrate (AI: potassium salts of fatty acids) to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number {.....}

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Table 5a: Reported effect of Neudorff's Insecticidal Soap Concentrate (AI: potassium salts of fatty acids) on Seedling Emergence.

Species	Results summary for height (lbs a.i./A)								
	Height(cm)	NOEC	EC ₀₅	95%CI	EC ₂₅	95%CI	EC ₅₀	95%CI	LOEC
Soybean	9.4-15.0	65.08	22	5.1-ND	>65.08	N/A	>65.08	N/A	>65.08
Tomato	1.8-2.2	32.54	0.00005 0	ND- 5900000	>65.08	N/A	>65.08	N/A	65.08

¹ Although treatment group means were reduced by 24% relative to the control at 32.54 lb a.i./A treatment level, the reduction was not dose-responsive and the EC₂₅ value was interpreted by the study authors as not being biologically-meaningful.

N/A Since less than the defined percent inhibition was observed, the EC₀₅, EC₂₅ and EC₅₀ values were empirically estimated, therefore, 95% confidence limits could not be determined.

Table 5b: Reported effect of Neudorff's Insecticidal Soap Concentrate (AI: potassium salts of fatty acids) on Seedling Emergence.

Species	Results summary for survival (lbs a.i./A), # survived/# planted								
	%	NOEC	EC ₀₅	95%CI	EC ₂₅	95%CI	EC ₅₀	95%CI	LOEC
Corn	100	ND	ND	N/A	ND	N/A	ND	N/A	ND
Onion	100	ND	ND	N/A	ND	N/A	ND	N/A	ND
Ryegrass	100	ND	ND	N/A	ND	N/A	ND	N/A	ND
Oat	100	ND	ND	N/A	ND	N/A	ND	N/A	ND
Bean	82-100	ND	ND	N/A	ND	N/A	ND	N/A	ND
Cucumber	92-100	ND	ND	N/A	ND	N/A	ND	N/A	ND
Oilseed rape	100	ND	ND	N/A	ND	N/A	ND	N/A	ND
Radish	100	ND	ND	N/A	ND	N/A	ND	N/A	ND
Soybean	100	ND	ND	N/A	ND	N/A	ND	N/A	ND
Tomato	100	ND	ND	N/A	ND	N/A	ND	N/A	ND

Data Evaluation Report on the Toxicity of Neudorff's Insecticidal Soap Concentrate (AI: potassium salts of fatty acids) to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number {.....}

EPA MRID Number 48402301

Table 5c: Reported effect of Neudorff's Insecticidal Soap Concentrate (AI: potassium salts of fatty acids) on Seedling Emergence.

Species	Results summary for emergence (lbs a.i./A)								
	%	NOEC	EC ₀₅	95%CI	EC ₂₅	95%CI	EC ₅₀	95%CI	LOEC
Corn	77-100	65.08	2.0	1.3-ND	N/A	N/A	N/A	N/A	>65.08
Onion	81-100	65.08	16	ND-32	>65.08	N/A	>65.08	N/A	>65.08
Ryegrass	91-97	65.08	<4.0	N/A	>65.08	N/A	>65.08	N/A	>65.08
Oat	100	65.08	>65.08	N/A	>65.08	N/A	>65.08	N/A	>65.08
Bean	67-80	65.08	0.00072	N/A	9.4	N/A	>65.08	N/A	>65.08
Cucumber	47-93	65.08	5.1	ND-20	61	17-160	>65.08	N/A	>65.08
Oilseed rape	83-97	65.08	>65.08	N/A	>65.08	N/A	>65.08	N/A	>65.08
Radish	93-100	65.08	>65.08	N/A	>65.08	N/A	>65.08	N/A	>65.08
Soybean	43-77	65.08	2.6	ND-20	43	11-120	>65.08	N/A	>65.08
Tomato	70-87	65.08	11	ND-64	>65.08	N/A	>65.08	N/A	>65.08

N/A - Since less than the defined percent inhibition was observed, the EC₀₅, EC₂₅ and EC₅₀ values were empirically estimated, therefore, 95% confidence limits could not be determined.

ND - Not determined

Mid-study emergence

Control	Onion	Ryegrass	Oat	Corn	Cucumber	Soybean	Oilseed Rape	Bean	Tomato	Radish	Formulation Blank
Not reported											N/A

Plant injury index

Control	Onion	Ryegrass	Oat	Corn	Cucumber	Soybean	Oilseed Rape	Bean	Tomato	Radish	Formulation Blank
0-4	0	0	0	0	0-8	0	0	0-18	0	0	N/A

0- No effect; 100- Complete effect

C. VERIFICATION OF STATISTICAL RESULTS BY THE REVIEWER:

Statistical Method(s): All analyses were conducted using the negative control only. Analysis

Data Evaluation Report on the Toxicity of Neudorff's Insecticidal Soap Concentrate (AI: potassium salts of fatty acids) to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number {.....}

EPA MRID Number 48402301

was conducted using Sprouts, a SAS program provided by EFED/OPP/USEPA, in SAS version 9. All endpoints for which replicate data were provided were examined graphically using graphs to determine if they exhibited a dose-dependent response, which was ultimately used to select the multiple comparison tests to detect the NOAEC. Data for each endpoint were tested to determine if their distributions were normal and if their variances were homogeneous using Shapiro-Wilk's and Levene's tests, respectively. Data that satisfied these assumptions were subjected to Dunnett's and William's tests and data that did not satisfy these assumptions were subjected to the non-parametric MannWhitney-U and Jonckheere's tests.

The reviewer analyzed survival using both the Sprouts method of assessment (# survived/# planted). Species with inhibitions of $\geq 5\%$ were statistically analyzed, and all others were visually assessed. For common bean, corn, cucumber, oilseed rape, onion, radish, ryegrass and soybean emergence and survival, and radish length and ryegrass weight data did not pass the tests for normality and homogeneity of variance, and were thus analyzed using the non-parametric Mann-Whitney tests. Toxicity values were visually determined. Due to high variability, the tests could not detect significance.

All analyses were conducted using the mean measured application rates of lbs active ingredient per acre (lbs a.i./A).

Data Evaluation Report on the Toxicity of Neudorff's Insecticidal Soap Concentrate (AI: potassium salts of fatty acids) to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number {.....}

EPA MRID Number 48402301

Table 6: Effect of Neudorff's Insecticidal Soap Concentrate (AI: potassium salts of fatty acids) on Seedling Emergence

Species	Results summary for biomass (lbs a.i./A)									
	Weight (g)	NOAEC	EC ₀₅	95% CI	EC ₂₅	95% CI	EC ₅₀	95% CI	Slope	95% CI
Corn	0.1624-0.1887	68.57	>68.57	N/A	>68.57	N/A	>68.57	N/A	N/A	N/A
Onion ²	0.0029-0.0042	68.57	>68.57	N/A	>68.57	N/A	>68.57	N/A	N/A	N/A
Ryegrass ²	0.0056-0.0064	68.57	>68.57	N/A	>68.57	N/A	>68.57	N/A	N/A	N/A
Oat ²	0.0533-0.0594	68.57	>68.57	N/A	>68.57	N/A	>68.57	N/A	N/A	N/A
Bean	0.1633-0.2607	68.57	>68.57	N/A	>68.57	N/A	>68.57	N/A	N/A	N/A
Cucumber ¹	0.0547-0.0921	68.57	NR	N/A	NR	N/A	NR	N/A	NR	N/A
Oilseed rape	0.0519-0.0647	68.57	>68.57	N/A	>68.57	N/A	>68.57	N/A	N/A	N/A
Radish ²	0.0713-0.0972	68.57	>68.57	N/A	>68.57	N/A	>68.57	N/A	N/A	N/A
Soybean	0.2125-0.3038	68.57	>68.57	N/A	>68.57	N/A	>68.57	N/A	N/A	N/A
Tomato ²	0.0063-0.0086	68.57	>68.57	N/A	>68.57	N/A	>68.57	N/A	N/A	N/A

¹ Statistical significance was determined for cucumber weight data due to a 38% inhibition at the 34.91 lb a.i./A test level; however, the model did not converge due to a lack of a dose-response effect; thus, toxicity values were unreliable.

² The data did not converge due to a promotion in growth. Toxicity values were visually determined.

N/A Since less than the defined percent inhibition was observed, the EC₀₅, EC₂₅ and EC₅₀ values were empirically estimated, therefore, 95% confidence limits could not be determined.

* Toxicity value should be interpreted with caution as it is not bracketed by the test concentrations.

NC- not calculable; referring to cases where the value was so extreme as to be deemed unreliable.

CBD- could not be determined.

NR – not reliable.

Table 6a: Effect of Neudorff's Insecticidal Soap Concentrate (AI: potassium salts of fatty acids) on Seedling Emergence.

Species	Results summary for height (lbs a.i./A)									
	Height(cm)	NOEC	EC ₀₅	95% CI	EC ₂₅	95% CI	EC ₅₀	95% CI	Slope	95% CI
Corn	28.7-31.8	68.57	>68.57	N/A	>68.57	N/A	>68.57	N/A	N/A	N/A
Onion	7.4-8.5	68.57	0.00044	0-1.41	>68.57	CBD	>68.57	CBD	0.0432	0.0022- (-0.0024)
Ryegrass	11.4-13.2	68.57	>68.57	N/A	>68.57	N/A	>68.57	N/A	N/A	N/A
Oat ¹	24.4-26.9	68.57	>68.57	N/A	>68.57	N/A	>68.57	N/A	N/A	N/A
Bean	5.0-7.0	68.57	>68.57	N/A	>68.57	N/A	>68.57	N/A	N/A	N/A

Data Evaluation Report on the Toxicity of Neudorff's Insecticidal Soap Concentrate (AI: potassium salts of fatty acids) to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number {.....}

EPA MRID Number 48402301

Table 6a: Effect of Neudorff's Insecticidal Soap Concentrate (AI: potassium salts of fatty acids) on Seedling Emergence.

Species	Results summary for height (lbs a.i./A)									
	Height(cm)	NOEC	EC ₀₅	95%CI	EC ₂₅	95%CI	EC ₅₀	95%CI	Slope	95%CI
Cucumber	2.8-3.6	16.83	5.59	0.10-312	>68.57	NC	>68.57	NC	0.62	0.25-(-1.39)
Oilseed rape	3.9-4.5	68.57	>68.57	N/A	>68.57	N/A	>68.57	N/A	N/A	N/A
Radish ²	1.9-2.2	68.57	>68.57	NC	>68.57	NC	>68.57	NC	0.4441	0.03-(-0.035)
Soybean	9.4-15.0	68.57	>68.57	N/A	>68.57	N/A	>68.57	N/A	N/A	N/A
Tomato ³	1.8-2.2	<4.426	21x10 ⁻⁷ *	NC	>68.57	N/A	>68.57	N/A	0.0963	0.0170-(-0.0262)

¹ The data did not converge due to a promotion in growth. Toxicity values were visually determined.

² Radish height data had a maximum promotion of 10%, the data converged but were not statistically significant; toxicity values are unreliable.

³ With the NOAEC determined to be below the lowest test level, the EC₀₅ will be used as a surrogate.

N/A - Since less than the defined percent inhibition was observed, the EC₀₅, EC₂₅ and EC₅₀ values were empirically estimated, therefore, 95% confidence limits could not be determined.

* Toxicity value should be interpreted with caution as it is not bracketed by the test concentrations.

NC- not calculable; referring to cases where the value was so extreme as to be deemed unreliable.

CBD- could not be determined.

Table 6b: Effect of Neudorff's Insecticidal Soap Concentrate (AI: potassium salts of fatty acids) on Seedling Emergence.

Species	Results summary for survival (lbs a.i./A), # survived/# planted									
	%	NOEC	EC ₀₅	95%CI	EC ₂₅	95%CI	EC ₅₀	95%CI	Slope	95%CI
Corn ¹	100	68.57	NR	N/A	NR	N/A	NR	N/A	NR	NR
Onion	100	68.57	29.4	0.0002-49.2	>68.57	NC	>68.57	NC	90.47	1.20-6809
Ryegrass ³	100	68.57	53.18	CBD	>68.57	CBD	>68.57	CBD	1.87	0.1179-29.561
Oat	100	68.57	ND	N/A	ND	N/A	ND	N/A	N/A	N/A
Bean	82-100	68.57	4.6	NC	>68.57	NC	>68.57	NC	3.59	0.06-218
Cucumber ²	100	68.57	1.65	CBD	23.8	CBD	>68.57	CBD	6.87	0.95-49.8
Oilseed rape ⁴	100	68.57	NR	N/A	NR	N/A	NR	N/A	N/A	N/A
Radish ⁵	100	68.57	NR	N/A	NR	N/A	NR	N/A	N/A	N/A
Soybean	100	68.57	4.07	CBD	43.79	CBD	>68.57	CBD	8.71	0.8706-87.2181
Tomato	100	68.57	13.05	CBD	>68.57	CBD	>68.57	CBD	7.12	0.1535- 330.44

Data Evaluation Report on the Toxicity of Neudorff's Insecticidal Soap Concentrate (AI: potassium salts of fatty acids) to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number {.....}

EPA MRID Number 48402301

Table 6b: Effect of Neudorff's Insecticidal Soap Concentrate (AI: potassium salts of fatty acids) on Seedling Emergence.

Species	Results summary for survival (lbs a.i./A), # survived/# planted									
	%	NOEC	EC ₀₅	95% CI	EC ₂₅	95% CI	EC ₅₀	95% CI	Slope	95% CI

¹ Corn survival data had a maximum inhibition of 23% at the lowest test level which was statistically significant; however, a dose-response relationship was not evident; thus, the NOAEC was determined to be at the highest test level. The model converged but the toxicity values were unreliable and not used.

² Cucumber survival data had a maximum inhibition of 50% which was statistically significant at 34.9 lb a.i./A; however, a dose-response relationship was not evident; thus, the NOAEC was determined to be at the highest test level. The model converged but the 95% confidence limits could not be determined.

³ Ryegrass survival data had a maximum inhibition of 6% which was not statistically significant and the model converged; however, the toxicity values were unreliable and the confidence intervals could not be determined.

⁴ Maximum inhibition of 4% at only the lowest level, not statistically significant; toxicity values are unreliable.

⁵ Survival data had a maximum inhibition of 7%, the data converged but were not statistically significant; toxicity values are unreliable

* Toxicity value should be interpreted with caution as it is not bracketed by the test concentrations.

NC- not calculable; referring to cases where the value was so extreme as to be deemed unreliable.

CBD- could not be determined.

NR – not reliable

Table 6c: Effect of Neudorff's Insecticidal Soap Concentrate (AI: potassium salts of fatty acids) on Seedling Emergence.

Species	Results summary for emergence (lbs a.i./A)									
	%	NOEC	EC ₀₅	95% CI	EC ₂₅	95% CI	EC ₅₀	95% CI	Slope	95% CI
Corn ¹	77-100	68.57	NR	N/A	NR	N/A	NR	N/A	NR	N/A
Onion	81-100	68.57	29.4	0.0002-49.2	>68.57	NC	>68.57	NC	90.47	1.2-6809
Ryegrass ³	91-97	68.57	53.18	CBD	>68.57	CBD	>68.57	CBD	1.87	0.1179-29.561
Oat	100	68.57	ND	N/A	ND	N/A	ND	N/A	N/A	N/A
Bean	67-80	68.57	2.5*	NC	>68.57	NC	>68.57	NC	1.83	0.06-55
Cucumber ²	47-93	68.57	1.65	CBD	23.8	CBD	>68.57	CBD	6.87	0.95-49.8
Oilseed rape ⁴	83-97	68.57	NR	N/A	NR	N/A	NR	N/A	N/A	N/A
Radish ⁵	93-100	68.57	NR	N/A	NR	N/A	NR	N/A	N/A	N/A
Soybean	43-77	68.57	4.07	CBD	43.79	CBD	>68.57	CBD	8.71	0.8706-87.2181
Tomato	70-87	68.57	13.05	CBD	>68.57	CBD	>68.57	CBD	7.12	0.1535- 330.44

¹ Corn emergence data had a maximum inhibition of 23% at the lowest test level which was statistically significant; however, a dose-response relationship was not evident; thus, the NOAEC was determined to be at the highest test level. The model converged but the toxicity values were unreliable and not used.

Data Evaluation Report on the Toxicity of Neudorff's Insecticidal Soap Concentrate (AI: potassium salts of fatty acids) to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number {.....}

EPA MRID Number 48402301

Table 6c: Effect of Neudorff's Insecticidal Soap Concentrate (AI: potassium salts of fatty acids) on Seedling Emergence.

Species	Results summary for emergence (lbs a.i./A)									
	%	NOEC	EC ₀₅	95% CI	EC ₂₅	95% CI	EC ₅₀	95% CI	Slope	95% CI

² Cucumber emergence data had a maximum inhibition of 50% which was statistically significant at 34.9 lb a.i./A; however, a dose-response relationship was not evident; thus, the NOAEC was determined to be at the highest test level. The model converged but the 95% confidence limits could not be determined.

³ Ryegrass emergence data had a maximum inhibition of 6% which was not statistically significant and the model converged; however, the toxicity values were unreliable and the confidence intervals could not be determined.

⁴ Maximum inhibition of 4% at only the lowest level, not statistically significant; toxicity values are unreliable.

⁵ Emergence data had a maximum inhibition of 7%, the data converged but were not statistically significant; toxicity values are unreliable.

N/A Since less than the defined percent inhibition was observed, the EC₀₅, EC₂₅ and EC₅₀ values were empirically estimated, therefore, 95% confidence limits could not be determined.

* Toxicity value should be interpreted with caution as it is not bracketed by the test concentrations.

NC- not calculable; referring to cases where the value was so extreme as to be deemed unreliable.

CBD- could not be determined.

NR – not reliable

Mid-study emergence											
Control	Onion	Ryegrass	Wheat	Corn	Carrot	Soybean	Lettuce	Flax	Tomato	Radish	Formulation Blank
Not reported											N/A

Plant injury index											
Control	Onion	Ryegrass	Oat	Corn	Cucumber	Soybean	Oilseed Rape	Bean	Tomato	Radish	Formulation Blank
0-4	0	0	0	0	0-8	0	0	0-18	0	0	N/A

0- No effect; 100- Complete effect

Monocot

EC₅₀/IC₅₀: >68.57 lbs a.i./A 95% C.I.: N/A

EC₂₅/IC₂₅: >68.57 lbs a.i./A 95% C.I.: N/A

EC₀₅/IC₀₅: >68.57 lbs a.i./A 95% C.I.: N/A

NOAEC: 68.57 lbs a.i./A

Slope: N/A

Std err: N/A

Most sensitive monocot: None

Most sensitive parameter: N/A

Data Evaluation Report on the Toxicity of Neudorff's Insecticidal Soap Concentrate (AI: potassium salts of fatty acids) to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number {.....}

EPA MRID Number 48402301

Dicot

EC ₅₀ /IC ₅₀ : >68.57 lbs a.i./A	95% C.I.: N/A
EC ₂₅ /IC ₂₅ : 23.8 lbs a.i./A*	95% C.I.: Not calculable
EC ₀₅ /IC ₀₅ : 1.65 lbs a.i./A*	95% C.I.: Not calculable
NOAEC: 68.57 lbs a.i./A	
Slope: 6.87	
Std err: 0.95- 49.81	
Most sensitive dicot: Cucumber	
Most sensitive parameter: Emergence and Survival	

* Toxicity value should be interpreted with great caution as the 95% confidence intervals appear unreliable.

D. STUDY DEFICIENCIES:

Deviations from OCSPP 850.4100 were noted:

1. The % organic carbon, cation exchange capacity, and % moisture of the soil were not reported.
2. The test temperatures ranged from 17 to 29°C daytime and 18-23°C nighttime; OCSPP guidelines suggest day temperatures of $25 \pm 3^\circ\text{C}$ and night temperatures of $20 \pm 3^\circ\text{C}$.
3. Relative humidity ranged from 19 to 102% during testing; OCSPP guidelines state that relative humidity should approach $70 \pm 5\%$ during light periods and 90 percent during dark periods. The study authors did not differentiate between day and night humidity readings.

These deviations were minor and do not impact the acceptability of this study.

E. REVIEWER'S COMMENTS:

The reviewer's and the study authors' results were somewhat in agreement. The reviewer's analysis did not reveal similar toxicity values as the study author's for bean; this was the only species to exhibit death of plants that successfully emerged. As a result, cucumber emergence and survival (for which toxicity values were similar between the reviewer and study author's results) was identified by the reviewer as having the lowest EC₂₅ estimate (and being the most sensitive dicot species). The reviewer notes, however, that many confidence intervals and slope values were unreliable or not calculable, and results for both the reviewer-determined dicot species should be interpreted with caution. The reviewer additionally based calculations on the measured concentrations, while the study author based calculations on the nominal concentrations. The reviewer's results are presented in the Executive Summary and Conclusions sections of this DER.

Data Evaluation Report on the Toxicity of Neudorff's Insecticidal Soap Concentrate (AI: potassium salts of fatty acids) to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number {.....}

EPA MRID Number 48402301

In this study, most plants that did emerge went on to survive; therefore, the % emergence and % survival revealed identical results for most species.

F. CONCLUSIONS:

The study is scientifically sound and satisfies the guideline requirement for a toxicity test with terrestrial plants. No monocot species were sensitive to the insecticidal soap. The most sensitive dicot species was cucumber, based on emergence and survival, with NOAEC, EC₀₅ and EC₂₅ values of 68.57, 1.65* and 23.8 lbs a.i./A*, respectively.

Most sensitive monocot and EC₂₅: None; >68.57 lb a.i./A

Most sensitive dicot and EC₂₅: Cucumber (emergence and survival); 23.8 lbs a.i./A*

* Toxicity value should be interpreted with great caution as the 95% confidence intervals appear unreliable.

III. REFERENCES:

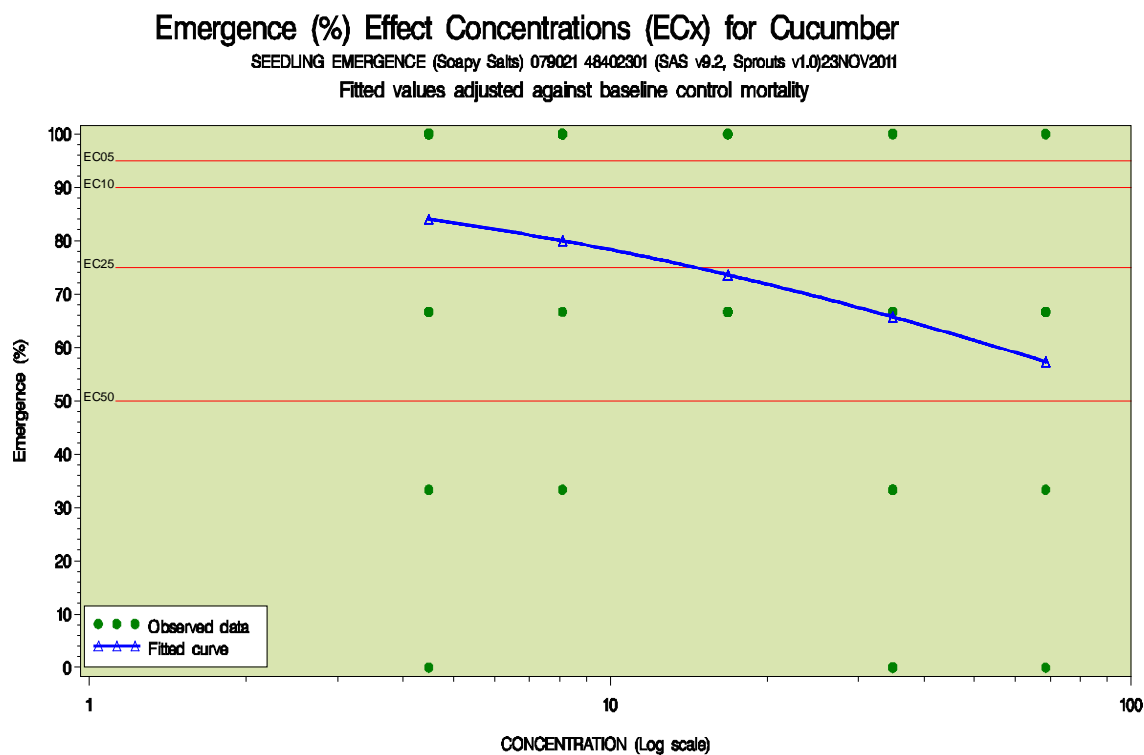
- U.S. Environmental Protection Agency. 2012. Ecological Effects Test Guidelines. OCSPP 850.4100, Seedling Emergence and Seedling Growth
- U.S. Environmental Protection Agency. 2012. Ecological Effects Test Guidelines. OCSPP 850.4000, Background and Special Considerations- Tests with Terrestrial and Aquatic Plants, Cyanobacteria, and Terrestrial Soil-Core Microcosms.

Data Evaluation Report on the Toxicity of Neudorff's Insecticidal Soap Concentrate (AI: potassium salts of fatty acids) to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number {.....}

EPA MRID Number 48402301

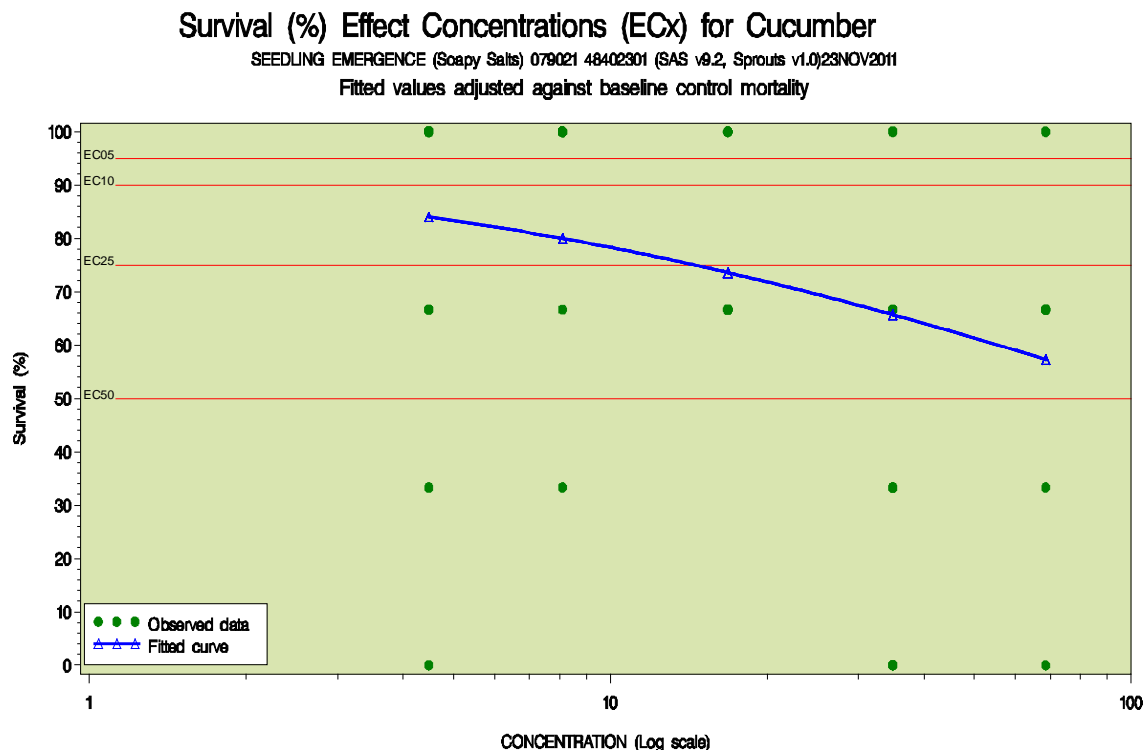
APPENDIX I. OUTPUT OF REVIEWER'S STATISTICAL VERIFICATION:



Data Evaluation Report on the Toxicity of Neudorff's Insecticidal Soap Concentrate (AI: potassium salts of fatty acids) to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number {.....}

EPA MRID Number 48402301



Analysis results for Variable: **PERCENT_EMERGE Cucumber**

(SAS v9.2, Sprouts v1.0) SEEDLING EMERGENCE (Soapy Salts) 079021 48402301 23NOV2011

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals --- alpha-level=.01

Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=.05

Use parametric analysis if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks	Shapiro-Wilks	Levenes	Levenes	Conclusion
Test Stat	P-value	Test Stat	P-value	
0.934	0.003	2.816	0.025	USE NON-PARAMETRIC TESTS

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	CV(%)	95% Confidence Interval
-1.000000	10	93.33	14.05	4.44	15.06	83.28 , 100.0
4.488300	10	73.33	34.43	10.89	46.95	48.71 , 97.96
8.104000	10	90.00	22.50	7.11	25.00	73.91 , 100.0
16.831000	10	86.67	17.21	5.44	19.86	74.35 , 98.98
34.909000	10	46.67	39.13	12.37	83.84	18.68 , 74.66
68.570000	10	63.33	29.19	9.23	46.08	42.45 , 84.21

Level	Median	Min	Max	%of Ctrl(means)	%Reduction(means)
-1.000000	100.0	66.67	100.0	.	.
4.488300	83.33	0.00	100.0	78.57	21.43
8.104000	100.0	33.33	100.0	96.43	3.57
16.831000	100.0	66.67	100.0	92.86	7.14
34.909000	50.00	0.00	100.0	50.00	50.00
68.570000	66.67	0.00	100.0	67.86	32.14

Data Evaluation Report on the Toxicity of Neudorff's Insecticidal Soap Concentrate (AI: potassium salts of fatty acids) to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number {.....}

EPA MRID Number 48402301

Analysis results for Variable: **PERCENT_EMERGE Cucumber**

NON-PARAMETRIC ANALYSES - use alpha-level=.05 for all tests

Kruskal-Wallis test - testing if at least one group differs signif. from others

Exact p-value Conclusion

0.0032 At least one group differs

Mann-Whitney-Wilcoxon (NO Bonf. adj) - test if each trt is signif. less than control

Jonckheere - Check plots! Test assumes a monotonically decreasing response. Testing neg. trend

Level	Median	%Reduc Ctrl (medians)	MannWW Exact p (NO Bonf)	Level	Median	Jonckheere p-value
Ctrl	100.0	.	.	Ctrl	100.0	.
4.488300	83.33	16.67	0.098	4.488300	83.33	0.064
8.104000	100.0	0.00	0.500	8.104000	100.0	0.444
16.83100	100.0	0.00	0.314	16.83100	100.0	0.362
34.90900	50.00	50.00	0.003	34.90900	50.00	0.006
68.57000	66.67	33.33	0.007	68.57000	66.67	0.001

RESULTS SUMMARY

NOAEC

LOAEC

Mann Whitney Test

16.831

34.909

Jonckheere-Terpstra Test

68.57

>highest dose

PARAMETER ESTIMATES FROM PROBIT ANALYSIS

Note: Baseline mortality correction factor used in estimating ECx values

Note: Algorithm converged.

WARNING: Do NOT report values below if convergence failed or convergence problems were noted.

Note that convergence does not necessarily mean a good model fit and/or good estimates!

LOOK AT GRAPHS! DO ESTIMATES MAKE SENSE? ECx estimates that fall outside the range of concentrations tested (along with their slope and CIs) are not likely to be reliable.

	Estimate	LowerCL	UpperCL
EC50	152.2186302	.	.
EC25	23.7958968	.	.
EC10	4.4782442	.	.
EC05	1.6481187	.	.

Slope (LowerCl, UpperCl)

6.8687 0.9471 49.8149

OBSERVED vs PREDICTED TREATMENT GROUP MEANS

Level	N	Observed Mean	Predicted Mean	(Obs-Pred)	Pred % of Ctrl	Pred % Reduc from Ctrl
-1.000000	.	93.33
4.488300	10	73.33	83.99	-10.65	89.99	10.01
8.104000	10	90.00	79.97	10.03	85.68	14.32
16.831000	10	86.67	73.57	13.10	78.82	21.18
34.909000	10	46.67	65.68	-19.02	70.37	29.63
68.570000	10	63.33	57.31	6.02	61.40	38.60

Analysis results for Variable: **PERCENT_SURVIVE Cucumber**

(SAS v9.2, Sprouts v1.0) SEEDLING EMERGENCE (Soapy Salts) 079021 48402301 23NOV2011

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals --- alpha-level=.01

Data Evaluation Report on the Toxicity of Neudorff's Insecticidal Soap Concentrate (AI: potassium salts of fatty acids) to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number {.....}

EPA MRID Number 48402301

Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=.05
Use parametric analysis if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks	Shapiro-Wilks	Levenes	Levenes	Conclusion
Test Stat	P-value	Test Stat	P-value	
0.934	0.003	2.816	0.025	USE NON-PARAMETRIC TESTS

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	CV(%)	95% Confidence Interval
-1.000000	10	93.33	14.05	4.44	15.06	83.28 , 100.0
4.488300	10	73.33	34.43	10.89	46.95	48.71 , 97.96
8.104000	10	90.00	22.50	7.11	25.00	73.91 , 100.0
16.831000	10	86.67	17.21	5.44	19.86	74.35 , 98.98
34.909000	10	46.67	39.13	12.37	83.84	18.68 , 74.66
68.570000	10	63.33	29.19	9.23	46.08	42.45 , 84.21

Level	Median	Min	Max	%of Ctrl(means)	%Reduction(means)
-1.000000	100.0	66.67	100.0	.	.
4.488300	83.33	0.00	100.0	78.57	21.43
8.104000	100.0	33.33	100.0	96.43	3.57
16.831000	100.0	66.67	100.0	92.86	7.14
34.909000	50.00	0.00	100.0	50.00	50.00
68.570000	66.67	0.00	100.0	67.86	32.14

Analysis results for Variable: **PERCENT_SURVIVE** Cucumber

NON-PARAMETRIC ANALYSES - use alpha-level=.05 for all tests

Kruskal-Wallis test - testing if at least one group differs signif. from others

Exact p-value	Conclusion
0.0032	At least one group differs

Mann-Whitney-Wilcoxon (NO Bonf. adj) - test if each trt is signif. less than control

Jonckheere - Check plots! Test assumes a monotonically decreasing response. Testing neg. trend

Level	Median	%Reduc Ctrl (medians)	MannWW Exact p (NO Bonf)	Level	Median	Jonckheere p-value
Ctrl	100.0	.	.	Ctrl	100.0	.
4.488300	83.33	16.67	0.098	4.488300	83.33	0.064
8.104000	100.0	0.00	0.500	8.104000	100.0	0.444
16.831000	100.0	0.00	0.314	16.831000	100.0	0.362
34.909000	50.00	50.00	0.003	34.909000	50.00	0.006
68.570000	66.67	33.33	0.007	68.570000	66.67	0.001

RESULTS SUMMARY

	NOAEC	LOAEC
Mann Whitney Test	16.831	34.909
Jonckheere-Terpstra Test	68.57	>highest dose

PARAMETER ESTIMATES FROM PROBIT ANALYSIS

Note: Baseline mortality correction factor used in estimating ECx values

Note:Algorithm converged.

WARNING: Do NOT report values below if convergence failed or convergence problems were noted.

Note that convergence does not necessarily mean a good model fit and/or good estimates!

LOOK AT GRAPHS! DO ESTIMATES MAKE SENSE? ECx estimates that fall outside the range of concentrations tested (along with their slope and CIs) are not likely to be reliable.

	Estimate	LowerCL	UpperCL
EC50	152.2186302	.	.
EC25	23.7958968	.	.
EC10	4.4782442	.	.
EC05	1.6481187	.	.

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Slope (LowerCl, UpperCl)
6.8687 0.9471 49.8149

OBSERVED vs PREDICTED TREATMENT GROUP MEANS

Level	N	Observed Mean	Predicted Mean	(Obs-Pred)	Pred % of Ctrl	Pred % Reduc from Ctrl
-1.000000	.	93.33
4.488300	10	73.33	83.99	-10.65	89.99	10.01
8.104000	10	90.00	79.97	10.03	85.68	14.32
16.831000	10	86.67	73.57	13.10	78.82	21.18
34.909000	10	46.67	65.68	-19.02	70.37	29.63
68.570000	10	63.33	57.31	6.02	61.40	38.60